mens demonstrate the exact features of these structures. Professor Bertrand, of Lille, and M. Hovelacque, of Paris, have simultaneously investigated the two lateral points on the leaf-scar, to which the former author has given the name of *parichnos*, which name Professor Williamson adopts. But these two palæontologists have further called attention to a fourth structure in these leaves, hitherto, in some degree, overlooked; and which they designated the *ligule*. The author finds this organ well developed both in *L. Harcourtii* and in *Lepidophloios*, but rejects the name ligule, on the ground that he cannot identify the fossil structure with the organ bearing the same name in living Isoetes and Selaginellæ. He, therefore, adopts for the former the term Adenoid organ, believing it to have had glandular functions. Details are also given of the organisation of several forms of Lepidostrobi, some of which are identified with their parent plants.

The general conclusion arrived at by the author in reference to the *L. Harcourtii*, which has been so often made the subject of debate during the last twenty years, is that it occupies no exceptional position amongst the other Lepidodendra, but that whilst palæontologists in various parts of the world quote the species as one with the organisation of which they were familiar, they were all alike mistaken in their determinations. Until now no specimen of the same plant has been in the possession of any observer less imperfect than that described by Brongniart; hence, when in the past authors have, as was my own case, referred various examples of cortex, leaves, and fruits to *Lepidodendron Harcourtii*, we have no evidence whatever that such references are true ones.

If such references are still declared to be authoritative, I must ask where the specimens are to be seen that carry our knowledge beyond what we derived from Harcourt's imperfect branch.

IV. "On Biologic Regions and Tabulation Areas." By C. B. Clarke, F.R.S. Received February 8, 1892.

(Abstract.)

Biologic regions have been used for two purposes, viz.: (1) to exhibit the most natural primary divisions of the globe, so far as the distribution of existing Mammalia (or of plants or living things) is concerned; (2) as areas of reference on which the complete distribution of a large genus or order of plants or animals may be tabulated.

It is clearly of the highest importance that one set of areas of reference should be employed by all naturalists, as foreseen by Mr. Wallace when he devised his primary zoologic regions and sub-regions. If one naturalist tabulates one order of Butterflies on one geographic

framework, and another naturalist tabulates another order of Butterflies on a different geographic framework, the results of the two naturalists can only be combined by doing the tabulation all over again, instead of by a simple addition.

Naturalists have not agreed on one system of primary reference areas; and, consequently, it is not possible to combine the results attained by different writers.

The first reason why naturalists have not accepted Wallace's recommendation is that his regions do not appear the most natural to many naturalists; Professor Huxley, Dr. Günther, and numerous botanists have proposed widely different regions as more natural. A second reason why these regions have not been used for tabulations is that their boundaries are (in many important cases) not accurately defined.

I have been for eighteen months past making trial of various geographic frameworks on which to tabulate the distribution of 2000 species of plants; and I have constructed a considerable number of maps, and have executed trial tabulations of a few genera on them. I have arrived at *one* conclusion which I deem of sufficient importance to bring before this Society, viz., that the two objects hitherto confounded in the designing of biologic regions must be kept entirely separate. Biologic regions representing the natural distribution of Mammalia or of life are *not* convenient to use as tabulation areas. I may venture to say, indeed, that the more perfectly natural the biologic regions are, and the more complex and detailed their boundary lines, the more impossible they are to use as reference areas or as tabulation areas on any considerable scale.

The idea of biologic regions presupposes a geographic framework of some kind on which the area of each genus of animals or plants was previously plotted. It appears to me that all naturalists, zoologists, botanists, and palæontologists, might easily agree to use one system of tabulation areas. Out of the results attained on this system, they might construct various biologic regions, each to please himself.

I have constructed, as a reference map for my own tabulations, the Map B. I would urge naturalists to use this, or that a committee be appointed to design a better, which should be put out by authority.

This Map B I have gradually arrived at by fixing down accurately the boundaries, and otherwise modifying the Map A, which is Wallace's map of zoologic regions. My object has been to make the smallest alterations in Wallace's map consistent with easy tabulation.

The greater part of the paper here abstracted is occupied with a detailed discussion of various boundary lines in the Map B, in order to bring out clearly the principles which should guide us in forming

our tabulation areas. One main object is that our primary framework of areas and sub-areas should separate our species and genera (so far as possible) into those areas and sub-areas; if a boundary line is drawn between two sub-areas A and B, so that nearly all the species found on one side of it are also found on the other, then we might as well, in this tabulation, have thrown the two sub-areas A and B into one, and saved ourselves labour. This brings us round practically pretty nearly to Wallace's view again; *i.e.*, geographic framework for reference and tabulation must be as near as possible to a system of natural biologic regions, subject to the condition that the boundary lines are rapidly and accurately fixed, and are easily remembered. It is impracticable to effect large tabulations of tens of thousands of specimens if it is necessary continually to refer to some special large-scale map.

The present paper is not intended to include marine regions or areas.

V. "The Electric Organ of the Skate: Observations on the Structure, Relations, Progressive Development, and Growth of the Electric Organ of the Skate." By J. C. EWART, M.D., Regius Professor of Natural History, University of Edinburgh. Communicated by Prof. J. BURDON SANDERSON, F.R.S. Received February 10, 1892.

(Abstract.)

After referring to the observations of Stark, the discoverer of the skate's electric organ, and to the work of Robin, Leydig, Babuchin, and others, the author describes the arrangement of the muscles in the tail of Selachians with a view to determining which muscles in the skate are transformed into the electric organs.

By comparing the caudal muscles of *Scyllium*, *Lamna*, *Myliobatis*, and *Raia*, it is made out that, while the middle row of muscular cones remains unaltered in the sharks and rays, it is transformed into a more or less perfect electric organ in the skates, the various members of the genus *Raia*. It is pointed out that, while the middle row of muscular cones is transformed in *Raia* into electric cones, the two adjacent rows of cones as in the rays and certain sharks diminish in size, and in some cases disappear about the middle of the tail.

In considering the structure of the organ, it is stated that, when the various modifications are taken into consideration, it may be described as consisting of a series of electric cones made up of more or less completely metamorphosed muscular fibres. Twenty-eight distinct cones were counted in the organ of *R. batis*. The first, which in a half grown fish measured 5 cm. in length, was all but